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THE

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OF THE

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XXIII.

INJURIOUS INSECTS AND OTHER ANIMALS OBSERVED IN IRELAND DURING THE YEAR 1907. BY GEORGE H. CARPENTER, B.SC., M.R.I.A., F.E.S., Professor of Zoology in the Royal College of Science for Ireland, and Consulting Entomologist to the Royal Dublin Society.

(PLATES XLIX.—LIV.)

[Read, MAY 19; Received for Publication, MAY 22; Published, AUGUST 29, 1908.]

PARASITES OF DOMESTIC ANIMALS.

The Common Tick.

Ixodes ricinus (Linn.).

THIS well-known species, which is found on many of our domestic animals, is received every year from various parts of the country. It is found mostly on cattle, sheep, and dogs. In May, 1907, specimens were given me by Mr. J. Malcolm, D.L., of Lurgan, who had taken them from dogs. He told me that the ticks were very hard to exterminate, as they had the habit of sheltering in the cracks of the kennel-building between bricks, and infesting other dogs after an interval of some months. It is known that ticks can live without food for a considerable time between the various feeding stages of their life-history, so that the facts are readily explicable, but such a sheltering-place is probably unusual.

The most familiar form of tick is the adult female (fig. 1, *b*), swollen with blood and eggs, to be found attached to animals, usually at the base of the legs where the skin is delicate, and where the parasite cannot be removed by biting or licking. Attachment is secured by the jaws—chelicerae and labium—which are provided with barbed processes, making the forcible withdrawal of the piercing-beak difficult. The arrangement of these barbs varies somewhat in the labium of the two sexes. Besides its use as a feeding apparatus, the beak of the male is used in pairing, being

thrust into the female's vulva (fig. 1, *b*, *v*) which is between the hind-most of the four pairs of legs. A female tick may be often found on cattle and dogs, with the comparatively small male (fig. 1, *a*), whose whole body is almost covered by the dorsal shield, clinging beneath. When she has gorged herself with blood from the host-animal, and her eggs have developed so that her leathery cuticle is enormously swollen, the female drops to the ground, and lays her eggs, 2,000 or more, among the herbage.

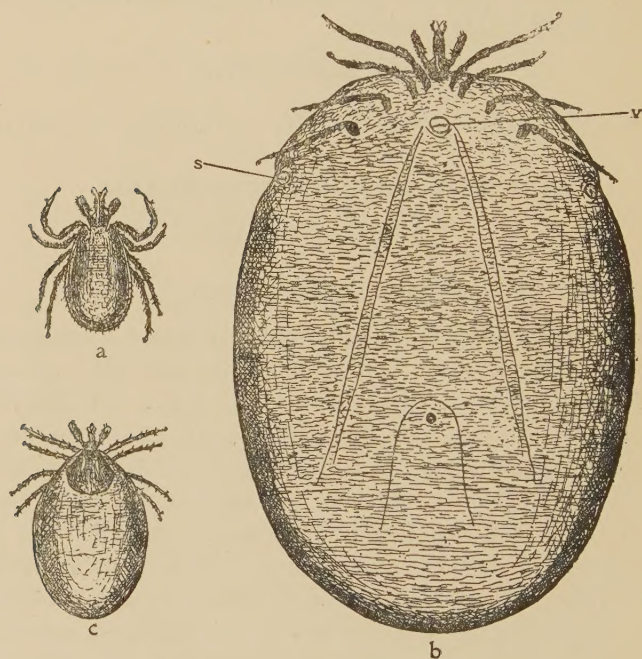


FIG. 1.—Common Tick (*Ixodes ricinus*) (*a*) male, dorsal view; (*b*) female, ventral view, swollen with blood and eggs: (*c*) nymph. Magnified 7 times.

From the eggs are hatched, about eight weeks after laying, the little six-legged larvæ or “seed-ticks,” which crowd on the herbage, waiting for the chance of fixing themselves to some passing animal. If they succeed, they suck blood for a few days, and then fall off again. After a while they cast the cuticle, and become changed into eight-legged “nymphs.” The nymph waits, like the larva, for some passing beast, and after another meal of blood (fig. 1, *c*)

drops off, casts its cuticle, and assumes the adult condition. The adults wait in the herbage for a suitable host on which they pair, the females, as explained above, becoming greatly distended. Thus the life-cycle is completed. The time occupied depends on the interval during which the growing tick has to wait for a "host" animal. It may live without food for six months, or even a year.

The obvious damage done by ticks to the animals that they infest is the loss of blood caused by their sucking. But a more serious danger is, that in sucking blood they transmit blood-parasites—possibly the cause of fatal disease—from one animal to another. These parasites are minute unicellular animals belonging to the Protozoan class Sporozoa. A short account of recent researches on these organisms may be therefore advisable.

The Red-water Parasite.

Piroplasma bovis (Bates.).

The parasite of red-water is a micro-organism found in the blood of cattle and in the digestive tract of ticks. It is undoubtedly a unicellular animal, belonging therefore to the Protozoa; and, like most parasitic Protozoa, it is a member of the class Sporozoa. All the Sporozoa are at some time intra-cellular

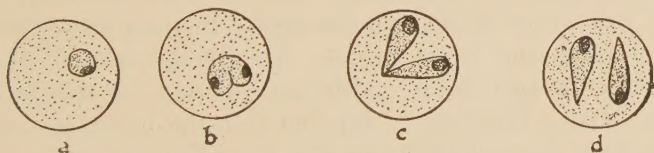


FIG. 2.—*Piroplasma bovis* in red corpuscles of bovine blood. Magnified 900 times, (a) amoeboid form; (b) division; (c) bigeminate form; (d) separation of "twins."

parasites, living within a single cell of the host-animal. *Piroplasma* is most frequently observed within the red blood-corpuscles of the affected cattle. In its best known stage it is a minute, pear-shaped body, about $\cdot 003$ mm. in length, and $\cdot 001$ mm. in thickness (*i.e.* $\frac{1}{8000} \times \frac{1}{25000}$ inch.). Within the corpuscle the parasite changes its shape, becomes circular or amoeboid, and finally divides in two, the two daughter-cells being often seen still attached by their narrow ends; hence the specific name *bigeminum*

often applied to the species. The multiplication of the parasites causes the red corpuscles to break down ; the parasites then become free in the plasma and invade other corpuscles, whose numbers thus become vastly reduced, while the red-colouring matter (hæmoglobin) diffused in the plasma is usually excreted by the kidneys.

Blood sucked by a tick from an infected cow or calf contains, of course, a large number of the minute parasites. It has been known for some years past that *Piroplasma* in the digestive tube of an adult female tick can give rise to infection in the offspring of that female, so that one generation of ticks can acquire the parasites from cattle, and the next generation can transmit the disease to other cattle. (See Mettam, 14.)

Further researches are needed as to the development of the parasites in the two generations of ticks. Several authors have made observations whose correctness is doubted by other authorities. According to the recent work of Christophers (9) on the Sporozoan blood-parasite of the dog (*Piroplasma canis*), the parasites drawn into the stomach of the blood-sucking female tick enlarge there, and then, perhaps after conjugation, they constrict to form vermicular, club-shaped bodies, which migrate from the digestive tract to the ovaries. There they enter the ova and enlarge to a diameter of .0025 mm., forming "zygotes." As the development of the tick proceeds, the zygotes divide to form sporoblasts in the embryonic and larval tissues. Finally the sporoblasts give rise to motile sporozoites which are collected in the salivary glands. Hence they can be injected into the blood of the vertebrate host on which the larval tick may fix itself. It is likely that the development of *Piroplasma bovis* in the tick is similar to this.

In any case we know that the long-continued existence of *Piroplasma bovis* in a district depends on the presence of its two host-animals—the ox and the tick. In this country the life-cycle of the ticks is so irregular with regard to the season of the year, that their extermination must be regarded as impracticable. But by keeping cattle off land where red-water has been prevalent, it may be possible—as suggested by Mettam (14)—to prevent ticks from getting a fresh supply of *Piroplasma*, and thus by stopping the

life-cycle to protect cattle that may be admitted to the once infested pastures after the offspring of the latest generation of Piroplasma-bearing ticks are all dead. The difficulty of stamping out the disease in this way lies in the fact that cattle reared in "red-water" districts become immunised by successive injections of the parasite when bitten early in life by infected ticks; and there is reason to believe that immune animals may harbour the Piroplasma for several years.

Scab and Itch Mites.

Psoroptes communis, Furst, *Chorioptes bovis* (Gerl.), and *Sarcoptes scabiei* (Linn.).

During the year specimens of all these three common genera of parasitic mites were received from various parts of Ireland. The various forms of "mange" or "scab" produced by their presence are well known, and appropriate treatment by "dips" or "washes" is described in veterinary writings. As the recognition of these genera is often practically important, it is advisable to give here a short systematic account of them.

All three are members of the family Sarcoptidæ, which includes very small mites with wrinkled cuticle, piercing jaws, and suckers on the feet; these secure attachment to their hosts, as all are parasites on various vertebrate animals. They have no spiracles, or air-tubes, but they breathe all over the surface of the body.

Commonest, and most important of the three, is *Psoroptes*, the true scab-mite. It has usually been stated that the *Psoroptes* found on various domestic animals all belong to one species, *P. communis*, but the forms on horse, ox, and sheep, are recognized as distinct species by Kramer and Canestrini (6), an opinion perhaps warranted by the fact that mites from one of these domestic hosts cannot infect another. The genus *Psoroptes* is readily distinguished by the presence of three segments on each foot of the first and second pairs of legs in both sexes (fig. 3). In the female the legs of the third pair do not terminate in typical feet, but each bears two exceedingly long slender bristles. The male has the third pair of legs normal, but the fourth are very short,

with a vestigial foot of a single segment only. The female (fig. 3, *b*) mite is oval in form; the male (fig. 3, *a*) more rotund, with paired, circular suckers near the hinder end, and a pair of prominent sub-cylindrical processes, which carry elongate bristles. The mites are about $\cdot 5$ mm. ($\cdot 02$ inch) in length. Each female *Psoroptes*

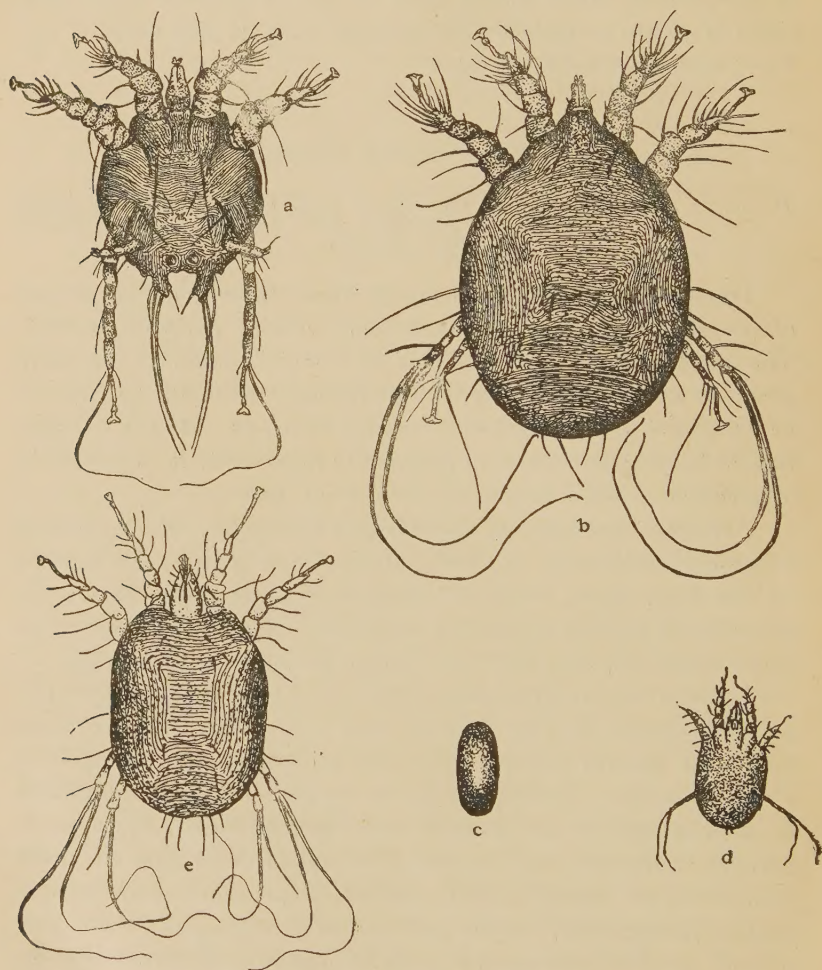


FIG. 3.—Scab-mite (*Psoroptes ovis*)—(a) male, ventral view $\times 70$; (b) female, dorsal view, $\times 70$; (c) egg, $\times 180$; (d) larva, $\times 180$; (e) nymph, $\times 180$. After Salmon and Stiles. Bull. 21, U. S. Dept. Agric. (Anim. Ind.).

lays about twenty eggs (fig. 3, *c*), which are attached to the skin or wool of the sheep. The tiny, six-legged young (fig. 3 *d*) are hatched in about a week, and after a short four-legged "nymph" (fig. 3, *e*) stage, develop in ten days into adults capable of pairing and laying eggs in their turn. The rate of multiplication is, therefore, enormous, and mites and eggs can live for several weeks after removal from sheep. Thus fences, hurdles, posts, and such structures can become centres of infection, while birds carry mites from scabby to healthy sheep. They attack the hairy parts of the skin, which they pierce with their barbed jaws,

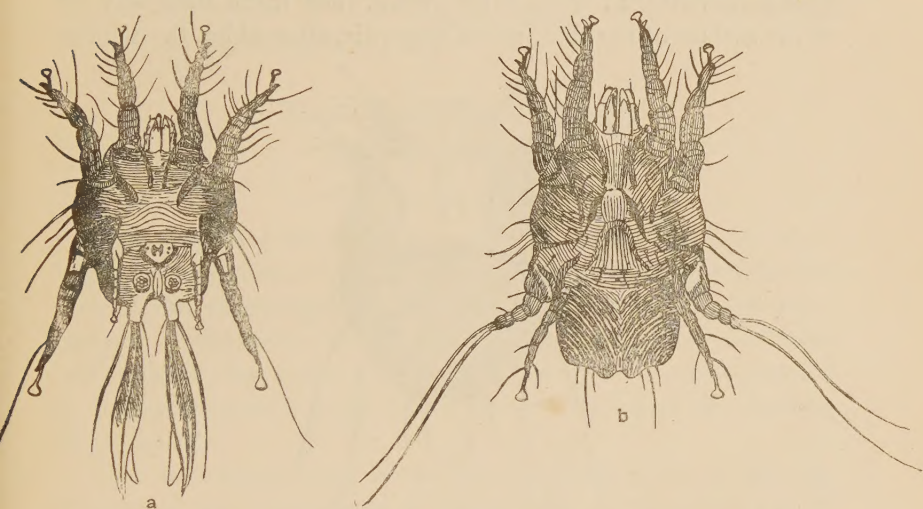


FIG. 4.—Mange Mite (*Chorioptes bovis*).—(*a*) male, ventral view, $\times 75$; (*b*) female, ventral view, $\times 75$. In part after Neumann.

causing great irritation, bleeding, and the discharge of serous fluid, which hardens to form the crust or scab beneath which the mites shelter. As a result of their presence, the wool becomes matted and soiled, and falls off. (See Salmon and Stiles, 17.)

Chorioptes resembles *Psoroptes* in general aspect, and the male (fig. 4, *a*) has a pair of short, bristle-bearing processes at the hinder end of the abdomen. The legs in this genus are relatively shorter and stouter than in *Psoroptes*, and the foot consists of a single segment only (fig. 4). These mites are found on the less hairy parts of their hosts' bodies. They caused much trouble on cattle

in County Dublin and elsewhere during the summer of 1907, and the infection could, in the cases that came under observation, be traced to a single centre.

The Itch Mite (*Sarcoptes scabiei*) is easily recognized (fig. 5) by its rotund form, and its very short, stumpy legs; each foot consists of one long segment only, but in the third pair of legs in the male, and in both third and fourth pairs in the female, this sucker-foot is replaced by a long, curving bristle. Itch Mites differ in habit from both *Psoroptes* and *Chorioptes* by burrowing into the skin. Within these burrows the female lays her eggs, from which her young are hatched; when fully grown, they make their way out to the surface of the skin, where they pair, after which the females

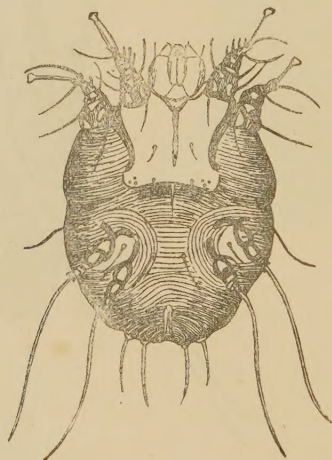


FIG. 5.—Itch Mite (*Sarcoptes scabiei*).—Ventral view of female, $\times 270$.

burrow to lay their eggs. On account of their burrowing habits, the Itch Mites are very difficult to eradicate. Dressing and dips for these, and also for *Psoroptes* and *Chorioptes*, are prescribed in works on veterinary practice. The attack of sarcoptic mange that was brought to my notice in 1907 was cured by the use of a corrosive sublimate wash—one part of the poison to 400 parts of water. This apparently soaked into the skin and killed the mites in their burrows without injury to the health of the affected cattle. The presence of *Sarcoptes* on cattle is evidently unusual, as no "*Sarcoptes bovis*" is mentioned in the recent work of Canestrini and Kramer (6).

CORN INSECTS.

The Ghost Swift Moth.

Hepialus humuli (Linn.).

Caterpillars of this well-known insect were sent in February from County Down, through the Editor of the *Farmer's Gazette*; they had been found in numbers in "lea ground for oats." An account of the species has been already given in a previous paper of this series (7, pp. 95-97). It is of interest that on this occasion the observer wrote: "Very few that are on or near the surface after the plough escape the birds."

The Common Rustic Moth.

Apamea didyma Esp.

(Plate XLIX.)

An interesting feature of the year was the presence of caterpillars of this common noctuid or "owl-moth" feeding within the base of the sheathing-leaves of barley and oats. Except for a mention of the species by Curtis (10, p. 225) as injurious to wheat, and a recent observation by Theobald (18, pp. 70-1) of its presence in Cocksfoot grass, I know of no record of the insect in economic literature.

The caterpillar was first noticed in May, 1906, by Mr. H. Hunter, of the Department of Agriculture, in the experimental barley plots at the Albert College, Glasnevin. Some of the young shoots were seen to be yellow and withered, and, on examination, such shoots were found to have been eaten at the base by the caterpillar, which sheltered in the hollow of the stem or within the sheathing-leaves. As in the case of the wheat recorded by Curtis, the caterpillar works downwards towards the roots. I was unable to identify or to rear the caterpillar in 1906. In May, 1907, however, it was found again damaging the barley in the same manner, and, towards the end of the month, I received from Mr. R. M. Barrington, of Fassaroe, Bray, County Wicklow, young oat-plants, which were attacked in just the same way by the same species of caterpillar. On offering some of the caterpillars

Cocksfoot grass (*Dactylis glomerata*), I was satisfied to see that they fed on it quite readily, working their way downwards to the base of the shoot, just as in the barley or oats. One of the caterpillars pupated on June 18th, and on July 25th there emerged a dark specimen of *Apamea didyma* (*oculea* Guen.).

This moth, one of the commonest of our native Noctuidæ, is exceedingly variable in colour and markings. The fore-wings may be reddish-brown, drab, or blackish, sometimes mottled all over with darker sealing, sometimes traversed by a dark, central, angulated band. Usually there is a conspicuous ovoid mark ("reniform stigma"), white, yellow, or pale-brown in colour. The hind-wings are dark-brown. The moth flies after dark in July and August, usually sheltering during the day among grass and other vegetation (Barrett, 1, pp. 391-6).

The caterpillar is variable in colour—usually some shade of green, the head, and a semicircular plate on the tail-segment, being brown. There are reddish dorso-lateral lines, sometimes very faint, and the spiracles are black. The eggs are laid in autumn, and the young caterpillars are hatched before winter, feeding on various kinds of grasses. There can be no doubt that in the cases now described the caterpillars had made their way from grasses to the growing cereals. This fact in the life-history suggests possible modes of preventing damage by the insects, by digging up the grassy "headlands" round cornfields. The concealed mode of feeding adopted by the caterpillar makes any remedial dressing impossible.

CLOVER, CABBAGE, AND MANGOLD INSECTS, &c.

Stem Eelworm.

Tylenchus devastatrix, Kuhn.

Some clover plants attacked by these well-known pests were received in November, from Mr. J. M. Adams, Agricultural Instructor for Co. Cork. Their presence caused the clover to "sicken," becoming black and dry over numerous patches in the field. The life-history and habits of these worms in connexion with an attack on oats have been discussed in a former paper of this series (7, pp. 285-8).

The Cabbage Fly.*Phorbia brassicæ*, Bouché.

As usual, attention was drawn to the presence of the maggots of this fly (7, pp. 141-4) both in the north and south of Ireland. At one locality in Co. Dublin, during July, besides tunnelling the roots in their usual manner, the maggots ate cabbage plants right through the base of the stem.

“Turnip-flies.”*Phyllotreta consobrina*, Curtis, and *P. nemorum* (Linn.).

(Plate L., B.)

Specimens of the flea-beetle *Phyllotreta consobrina* were received in June, from Stillorgan, Co. Dublin, where they were devouring cabbages. So far this species has only been noticed in Ireland in this county (see Johnson and Halbert, 12, p. 771); but it occurred here in sufficient numbers eight years ago to be seriously injurious to cruciferous crops, as again last year. It belongs to the same genus—*Phyllotreta*—as the common “Turnip-fly” (*P. nemorum*). As is well known, this genus belongs to a section of the Chrysomelidæ (leaf-beetles), in which the thighs of the hind-legs are remarkably large and thick, so that the insects jump with great agility, and have come to be known as “flea-beetles.” The species of *Phyllotreta* are small beetles of elongate oval form, the cavities of the front haunches open behind, the punctures on the wing-cases not arranged in linear striæ, and the pronotum without a transverse impression.

P. consobrina (Plate L., B, 2) is one of the dark, unicoloured species of the genus, the upper surface being blackish, with a blue or green reflection, very closely and rather strongly punctured; the feelers and the legs are all black. The insect measures from 2 to 2·5 mm. ($\frac{1}{12}$ – $\frac{1}{10}$ inch) in length. *P. nemorum*, like *P. undulata*, Kutz, another species which is sometimes injurious, has a conspicuous, yellow, longitudinal stripe on each wing-case. In *P. nemorum* (Plate L., B, 1), this stripe is waved in the middle, the basal segments of the feelers are light yellow, and the shins

of all the legs are reddish-yellow. *P. nemorum* is rather larger than *P. consobrina*, being from 2.5–3 mm. ($\frac{1}{10}$ – $\frac{1}{8}$ inch long). (See Fowler 11, vol. iv., pp. 361–6.)

The habits and life-histories of these “Turnip-flies” are well known to all. *P. nemorum* is common everywhere in Ireland, and its yearly appearance is so familiar that but little attention is paid to it. The insects pass the winter in the perfect state, and come out of their shelters in early spring to lay eggs on cruciferous plants. Until the turnip and cabbage seedlings are ready, they content themselves with charlock and other weeds belonging to the Cruciferae. The white, caterpillar-like larvæ, with three pairs of thoracic legs, and a chitinous plate with a pair of spiny processes at the tail-end of the abdomen, mine in the green tissues of the leaves. The transformation is completed in about three weeks, and the beetles feed greedily on the leaves from outside. Contrary to the general rule, the greatest damage is done by these beetles in the adult, and not in the larval, stage. Successive generations appear through the summer, often with disastrous results to crops, especially in dry seasons.

Many suggestions for checking the ravages of “Turnip-flies” have repeatedly been made, such as dusting with lime and soot, knocking off the beetles with brushwood or mechanical appliances, or catching them on tarred boards. None of these can be recommended with any confidence. Thick and early sowing, and the clearance of cruciferous weeds, are obvious preventive measures. Some years ago statements were made (see 7, pp. 140–1) as to the success of spraying with the “Bordeaux mixture” (copper sulphate and lime) at half the strength used for spraying against potato-blight. Careful experiments with this would be well worth trying; and in bad attacks, farmers should certainly try the effect of spraying with lead arsenate, which would probably not fail to kill the beetles, and, if applied with care, could be used without danger to man or beast.

Ground Beetles.

Pterostichus cupreus (Linn.) and *Taphria nivalis*, Panz.

(Plate L., c.)

That certain species of the carnivorous family Carabidæ often

devour mangold plants, cutting them through at the ground-level, has long been known. An account with figures of these species—*Pterostichus madidus*, Fab., *P. vulgaris*, Fab., and *Harpalus ruficornis*—has been given in a former paper (7, pp. 150-1). In June, 1907, mangold plants, eaten through, were received from Rathnew, County Wicklow, together with specimens of two other species of ground beetles (Carabidæ), viz.: *Taphria nivalis*, Panz. and *Pterostichus cupreus* (Linn.). *P. cupreus* (Plate L., c, 1) is a smaller beetle than *P. madidus* or *P. vulgaris*, being 10-12 mm. (less than $\frac{1}{2}$ inch) long, and it is usually green, bronze, coppery, or purple in colour, though occasionally black like those species. Its feelers are black with the two basal segments red, its pronotum sub-quadrate with broad, rounded margins, and its legs black. It is a common beetle throughout Ireland.

Taphria nivalis (Plate L., c, 2), is the only Britannic species of its genus, which is characterized by the comb-like teeth on the foot-claws, the rounded sides of the pronotum, and the long, oval wing-cases. *Taphria* agrees with *Pterostichus* in having three segments of the fore-foot broadened in the male. *T. nivalis* is a shining pitch-black species, 6-7 mm. ($\frac{1}{4}$ – $\frac{5}{16}$ inch) long; the feelers, palps, and legs are red, and the edges of the pronotum may be reddish. It has a wide distribution in Ireland, and is common in the more hilly districts (12, p. 577).

Probably the method of trapping by sunken tins or jars baited with putrid meat, that has been found effectual against the larger species, would also be the best means of destroying these.

The Bright-line Brocade Moth.

Mamestra oleracea (Linn.).

(Plate LI., d.)

The conspicuous striped caterpillars of this moth were received in October, from Counties Waterford and Cork, with the information that they were causing much damage to crops of mangold and turnip. I am indebted to Mr. J. Johnston, County Instructor in Agriculture, for a full account of some observations on the habits of the insects in Waterford. This, although a very common caterpillar, has not, I believe, been previously noticed as

injurious to any farm crop; the occurrence is therefore noteworthy.

Mamestra oleracea is one of the Noctuidæ or owl-moths. It is easily recognized by its dull purple-red fore-wings, each with a conspicuous orange spot on the disk, and a distinct white subterminal line, which is produced in the middle to the margin, somewhat in form of the letter W; the hind-wings are dusky-whitish. The moth flies in June and July, and may be commonly seen at dusk in gardens and fields, and on grassy banks; it usually hides by day among plants or on walls and fences. (Barrett, 1, p. 187.) It measures from 35–40 mm. ($1\frac{2}{3}$ – $1\frac{3}{5}$ inches) across the wings. The caterpillar, hatched from eggs laid at midsummer, becomes fully grown in autumn. The caterpillars are variable in colour—brown, pink, green, or yellow, always with white mottling, and with a very distinct and conspicuous yellow stripe in the region of the spiracles. They feed on a great variety of plants, but especially on goosefoot, nettle, dock, and sow.ow.

Usually these caterpillars are fully grown by the end of September; but last year they continued to feed through October, and it was then that they caused so much damage to mangolds and turnips. In one field near Dungarvan the mangolds were almost stripped of leaves, and everywhere they were eaten into holes. The glossy black pupa lies underground from October till June in a cocoon of earth and silk; appropriate winter treatment of the land may, therefore, be expected to destroy many of the insects in that stage. Mr. Johnson suggested scarifying the surface after the crop has been gathered, so as to expose the pupæ to birds and frost, or ploughing with a skim-counter, so as to bury them deeply, or dressing with a mixture of lime and salt, 10 cwt. lime and 5 cwt. salt to the acre.

POTATO AND PARSNIP INSECTS.

Potato Flea-beetle.

Psylliodes affinis, Payk.

Potato-leaves eaten by these beetles, already described in a former paper (7, pp. 254–5), were received early in June from Newcastle, County Down.

Potato Stem-borer.*Gortyna ochracea*, Hb.

The habit of the caterpillar of this moth, feeding in stems of potato, has already been described (7, pp. 253-4). A specimen was received from Ferns in May last year.

The Carrot-fly.*Psila rosæ* (Fab.).

Parsnips from Navan, County Meath, were handed to me in February, by Dr. G. H. Pethybridge; the roots were eaten by the well-known maggots of this fly (7, pp. 255-7). We have here a good illustration of how these insects continue to feed through a mild winter.

TOBACCO INSECTS.

The cultivation of a new exotic crop, like tobacco, in Ireland, affords interest to the biologist in the observation of certain of our native insects which may be attracted to feed on it. During 1907 there were plots of tobacco in various districts of the country; and I am indebted to Mr. G. W. Keller, the American expert of the Department of Agriculture, for the opportunity of examining a number of insects observed by him.

Cabbage and Bright-eye Moths.*Mamestra brassicæ* (Linn.) and *M. oleraceæ* (Linn.).

(Plate LI., D, E.)

During August and September, caterpillars of the Bright-eye Brocade Moth (*Mamestra oleraceæ*) and of its well-known congener the Cabbage-moth (*M. brassicæ*) were noticed eating tobacco plants in County Cork. Only a few plants were attacked, but the leaves of those were very badly eaten. *Mamestra oleraceæ* has already been described above (p. 572) in connexion with the ravages of its caterpillar on mangold. *M. brassicæ* (Plate LI., E) has a very similar life-cycle, the moth being on the wing from June till August, the

caterpillar feeding till September, and the buried pupa being the wintering stage. The moth has blackish-grey forewings with white discal spots, and a toothed whitish subterminal line. It measures 33-43 mm. ($1\frac{1}{3}$ - $1\frac{3}{4}$ inches) across the outspread wings. The caterpillar is brown or green, with dark dorsal line, often with paired, black longitudinal marks at the hinder end, and there is a yellowish lateral line below the spiracles; this is the caterpillar that is not infrequently boiled with cabbage. The most effective way of combating these moths is evidently to destroy the wintering pupa.

Wireworms.

Agriotes sp., &c.

(Plate LII.)

The larvæ of *Agriotes*—the “Wireworms”—so destructive to all kinds of crops in this country—have already turned their attention to tobacco. Seedlings badly eaten by these, and by the larvæ of some other Elaterid or “Click-beetle,” were received from County Cork in July. It is evident that all care should be taken to clear land intended for tobacco from Wireworms, as far as possible, by the usual well-known methods. Those who use “Vaporite” against Wireworms should remember that, as it must be dug into the soil to be effective, it can only be used before sowing or planting out.

A New Irish Springtail.

Isotoma tenella, Reuter.

At the end of April Mr. Keller sent me, from Kilkenny, tobacco seedlings, the leaves of which were covered with multitudes of small, dark-greyish Springtails or Collembola. Reference to the root-feeding habits of the lowly wingless insects of this order has been previously made in this series of papers (pp. 251-3). On the present occasion the species was eating the leaves, whose surfaces showed distinct abrasion, while the digestive tracts of the springtails contained chloroplasts. The springtail was clearly an *Isotoma*—a genus distinguished by the close equality in length

of the third and fourth abdominal segments; by the absence of scales on the cuticle; by the presence of a well-developed spring; and by the simple nature of the characteristic post-antennal sense-organ (fig. 6, 2). But the species had never been recognized before, either in Ireland or in Great Britain, so that we had, as occasionally in previous cases, an addition to our fauna forcing itself on our attention by damaging cultivated plants. It proved to be *I. tenella*, Reuter, first described from Finland, and recently noticed in Germany. There can be little doubt that the species is truly indigenous in Ireland, and that the new food-plant—in shape of the tobacco seedlings—incited it to increase enormously in numbers in one particular locality.



FIG. 6.—*Isotoma tenella*. (1) side-view of insect, $\times 75$; (2) left-ocelli and post-antennal organ, $\times 500$; (3) hind-foot, $\times 500$; (4) dens and mucro of spring, $\times 500$. From Carpenter, *Irish Naturalist*, vol. xvii.

Isotoma tenella is easily recognized by the foot with simple claw, with very narrow tapering empodium, and with two tenent (clubbed) hairs (fig. 6, 3), and by the characteristic mucro (claw) at the end of each branch of the spring with its two teeth

(fig. 6, 4). Like most species of *Isotoma*, *I. tenella* has eight simple eyes (ocelli) on each side of the head; its post-antennal organ is somewhat broadly ovate in form. The insect measures only 1 mm. ($\frac{1}{25}$ inch) or slightly more in length.

Although these springtails appeared to find tobacco-leaves a very satisfactory food, Mr. Keller succeeded in killing them in numbers with a nicotine fumigator.

ORCHARD INSECTS.

The Gooseberry Sawfly.

Nematus ribesii (Scop.).

Caterpillars of this well-known insect, described and figured recently in this volume (7, pp. 335-7), were received from Cork on May 21st. Some of them pupated immediately; and a number of flies—all females—emerged between the 6th and the 10th June.

The Winter Moth.

Cheimatobia brumata (Linn.).

This familiar and destructive insect has also been recently described (7, pp. 329-31). Its young caterpillars were sent from Cork by Mr. J. M. Adams, on May 10th. They had been feeding on the blossoms, so as to prevent the setting of the fruit. On May 23rd, blossoms eaten by the caterpillars were received from County Armagh. Early in June, caterpillars of the same moth were received from Antrim. These had been feeding in a manner unusual for the species—boring into gooseberries ripening on the bushes, so as to tunnel and disfigure them badly.

The Pith Moth.

Blastodacna vinolentella (Herr.-Schäff.).

This is another species of moth recently (7, pp. 333-4) dealt with in these reports. A pupa in a bored apple-twigg was observed in July, at Glasnevin.

Common Vapourer Moth.*Orgyia antiqua* (Linn.).

(Plate LIII., G.)

Twigs of apple with cocoons and egg-masses of this insect were received from County Clare in February. It belongs to the family of the Lymantriidæ, characterized by the strongly pectinated feelers of the male, the vestigial condition of the jaws in the moth, the presence of a dense hairy covering on the caterpillar, the hairs being frequently arranged in tufts or "tussocks," and a thin hairy coat on the pupa. The male of *O. antiqua* measures from 25 to 30mm. (1-1½ inches) across the outspread wings, which are yellowish-brown in colour, traversed by darker lines, and showing a conspicuous white spot near the hind corner; the hind-wings are deep orange-brown. The moth may be observed flying around trees in September and October. The female is a stout, brown, hairy insect, with short, feeble feelers and legs, and her wings greatly reduced, so that, of course, she cannot fly. She merely emerges from the dense cocoon on the food-plant, in which the pupal-stage has been passed, and, after pairing, lays her eggs in a mass on the cocoon. These eggs remain unhatched through the winter, and the species is often spread to new localities by young trees on which are egg-clusters being planted in late autumn. The little, hairy caterpillars are hatched in April and May. They feed greedily on the leaves of many different trees—notably Rosaceæ—and become fully grown in August. Then the caterpillar is from 1 to 2 inches long, greyish, with a black dorsal line and red spots, adorned with whitish hairs, and furnished with a series of dorsal "tussocks," either black or yellow, black on the first thoracic and eighth abdominal segments, yellow on the first, second, third, and fourth abdominal; there are also lateral tufts of black hairs on the first thoracic and second abdominal segments. When full-fed the caterpillar makes a rather dense cocoon of silk and its own cast hairs, within which the pupal stage, lasting only a few weeks, is passed. The caterpillars are very active, sometimes migrating in search of fresh food-plants. This habit is useful for the extension of the insect's range, as the female cannot fly.

Spraying with lead-arsenate wash poisons the caterpillars, against which emulsions are of little or no use. The clearance of the cocoons with the attached eggs in winter should be carried out wherever practicable.

The Eyed Hawk-moth.

Smerinthus ocellatus (Linn.).

The large caterpillars of this handsome moth attract attention in some years by the damage that they do to apple foliage. During 1907 specimens of them were sent by two of the County Horticultural Instructors—Mr. P. R. Farrelly, of Kildare, and Mr. P. J. Callan, of West Cork. The insect is a well-known member

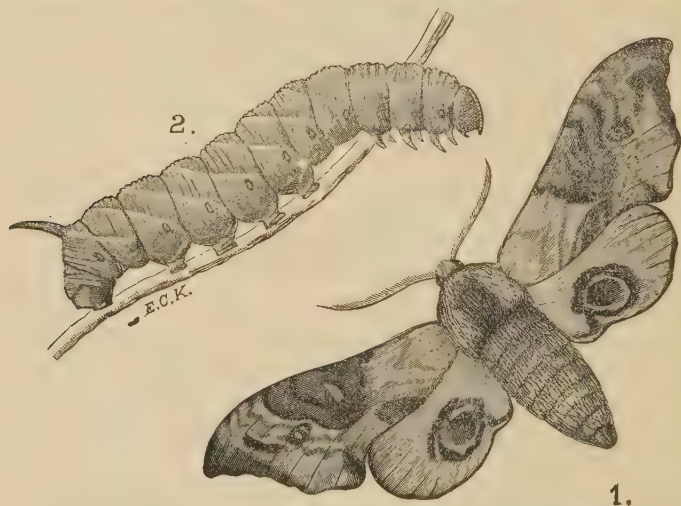


FIG. 7.—Eyed Hawk-moth (*Smerinthus ocellatus*) and its caterpillar. From Ormerod's "Reports."

of the Sphingidæ (Hawk-moths), large, robust moths of powerful flight, with elongate fore-wings and shorter hind-wings, spindle-shaped feelers, and long, flexible proboscis. *Smerinthus ocellatus* measures from 75 to 90 mm. (3–3½ inches) across the outspread fore-wings, which are pale-reddish brown, with darker brown markings; the hind-wings are reddish, each with a blue-ringed eye-spot, which gives the name to the species (fig. 7, 1). The moths are on the wing in May and June; the caterpillar appears in

July. When fully grown it is green, with a series of slanting white lateral stripes, and red spots. As in most sphingid caterpillars, there is a conspicuous "horn" on the eighth abdominal segment; and in the present species this horn is blue, whereas in the nearly allied *S. populi* it is yellowish-green.

The caterpillar (fig. 7, 2) of *S. ocellatus* feeds on poplar and various kinds of willow, as well as on apple. Mr. Farrelly noticed in Kildare that the larvæ ate the tender leaves close to the stem. Mr. Callan stated that near Clonakilty there were usually two or three caterpillars on each tree, and that they fed most vigorously in close, showery weather, sometimes defoliating a small tree in a few days. Hand-picking is the simplest and surest remedy. The caterpillar is fully grown in September, towards the end of which month it usually pupates in an earthen cell in the ground; thus it passes the winter.

Weevils.

Otiorrhynchus sulcatus, Fab., and *O. picipes*, Fab.

These well-known beetles were received in May from County Wexford, where the clay-coloured species (*O. picipes*) was reported as very destructive to the foliage of pear-trees. The true weevils form a large family (Curculionidæ) of the beetles (Coleoptera), easily recognized by the elongation of the head into a beak or snout, at the end of which are the jaws, the elbowed feelers being inserted at the sides of the snout near the tip. In the genus *Otiorrhynchus* the snout is swollen at the tip, and its scrobes¹ or furrows are on the upper surface, not at the sides; the feelers have an elongate scape, and the thighs are club-shaped and often toothed. *O. sulcatus*, the larger of the two species, is 9-10 mm. (about $\frac{2}{3}$ inch) long, black and shining in colour; the elytra, with deep furrows, and coarsely granulated, are without scales, but with tufts of yellow hairs, and the front thighs are distinctly toothed. *O. picipes* measures only from 6.5 to 8 mm. (about $\frac{3}{10}$ inch) long; its elytra have a covering of small round scales and ashy hairs, its legs are red or pitchy-red, and the tooth on the front thigh is indistinct (fig. 8, 1, 5).

¹ See Fowler (11) vol. v., pp. 178-9.

The larvæ of *Otiorrhynchus* (fig. 8, 3, 6) are white, fleshy, rather hairy grubs with much wrinkled cuticle, and hard, brown heads provided with strong mandibles. They lie curled up in the earth, eating the roots of plants. The eggs are laid in the ground by the parent beetle late in the summer, and the grubs feed and grow until the spring of the next year, when they pupate. The beetles eat leaves and blossoms, and at times

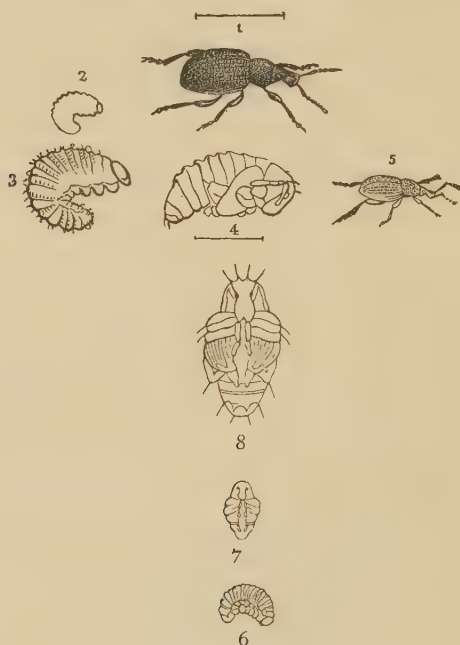


FIG. 8.—1 *Otiorrhynchus sulcatus*, enlarged; 2, 3, its larva, natural size and magnified; 4, its pupa, magnified; 5, *O. picipes*; 6, larva; 7, pupa, natural size; 8, pupa, magnified. From Ormerod's "Reports."

gnaw the bark of orchard trees, and of many garden and greenhouse plants, so that, as the larvæ eat roots, a double toll is levied on the plants by the two stages of the insects' life-history. Raspberries and vines are especially subject to the attacks of the beetles, which feed by night, hiding by day beneath clods or stones.

This feature of their habits enables us to stop their ascent to the trees and bushes by sticky bands, or by lime placed around the trunks or stems. In the case of trees against walls, the walls

should be well pointed and whitewashed, and a layer of lime placed along the bottom. At night, with a lantern, it is easy to shake the weevils down on to sheets or tarred boards, so that they may be destroyed. Spraying with arsenate of lead may be tried in the worst cases.

The Black Currant Mite.

Eriophyes ribis (Westwood).

A description of this mite, of which examples are received every year from various localities, has been previously given (7, pp. 260–2). Very contradictory reports have been given as to the effect of dusting with lime and sulphur, as recommended by Collinge (see 7, p. 441). On the whole, it must be admitted that such dusting cannot be relied on to prevent the migration of mites from old to new buds. Some interesting notes on the habits of the species were published during 1907 by Massee (13), who regards the upright position assumed by the migrating mites as a preparation for pairing. He states that when a mite is in the upright posture, “if another mite approaches, the two come in contact, . . . apparently a sexual act.” Massee found that he could stop the access of the mites to healthy buds by vaseline bands around the twigs, and that painting the big buds with vaseline prevents the escape of the mites from their old habitations. Sticky substances, such as cart-grease or palm oil, applied with a brush to infected bushes, were found to answer practically; the painting of individual buds and twigs would, of course, be impossible on a large scale.

The Pear-leaf Blister Mite.

Eriophyes pyri (Nalepa).

Pear-leaves with the characteristic blisters caused by these mites were received from Co. Dublin, both north and south of the city, during May and June. The mite which causes this deformation is, like the Currant Mite, a small elongate creature, with only two pairs of legs. It measures only .2 mm. ($\frac{1}{125}$ inch) in length, and is relatively stouter and with more elongate rostrum than the Currant mite. Leaves infected with these mites are covered with

little rotund blisters—at first green or red, afterwards black or brown in colour. The blisters appear raised on both surfaces of the leaf, and a small central hole, leading into the cavity of the blister, is evident on the lower surface.

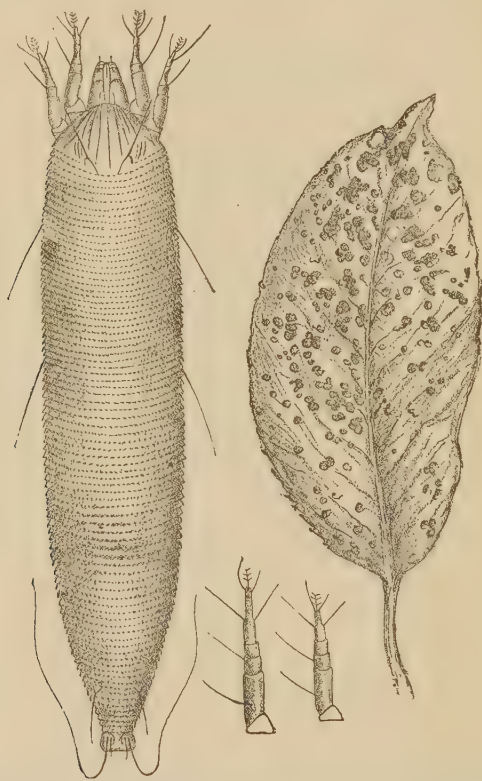


FIG. 9.—*Eriophyes pyri*, highly magnified, its legs more highly magnified (after Nalepa), and blistered pear-leaf, natural size. From Ormerod's "Reports."

It is known that the mites spend the winter "in the leaf and flower-buds of the one-year-old twigs, embedded in the felt-like layer of hairs on the inside of the outer bud-scales" (Ormerod, 15, p. 129). From these shelters they come out in early spring and attack the opening leaves, their presence in which is soon shown by the appearance of the blisters described above. Within the blisters they breed and lay eggs, and the young mites make their way out of the central hole below the leaf to invade the

tissues elsewhere and form other blisters. Thus multiplication goes on through the summer, and before the fall of the leaf the mites seek the shelter of the winter buds.

Spraying with paraffin emulsion—as strong as can be safely applied to the foliage—checks the migration of the mites and the spread of the blisters. Strong spraying in winter is recommended as a preventive.

HAWTHORN INSECTS.

The Small Ermine Moth.

Hyponomeuta padellus (Linn.).

An account of this insect was given in my paper of last year (7, pp. 436–7), and reference was made to the damage done by the caterpillars to Hawthorn hedges in Co. Waterford. In June and July, 1907, Mr. J. Johnston, the County Agricultural Instructor, informed me that they were again most destructive to the hedges of a farm at KilmacThomas, belonging to Mr. E. Flahavan, who wrote that on some of the hedges not a single leaf remained, and that he hoped for the starvation of the caterpillars as a result.

While this paper is in press, I have heard from Mr. Johnston of the good effects this summer of spraying with lead arsenate wash. No result was seen for some days; but three weeks after the spraying, only one live caterpillar could be found, and Mr. Johnston noticed hundreds of dead specimens.

FOREST INSECTS.

The Pine Sawfly.

Lophyrus pini (Linn.).

An account of this insect was given in my paper of last year (7, pp. 447–8). At the end of September, 1907,¹ I received caterpillars of the species from Mr. E. W. Holt, who told me that they had been very destructive to Scots and Austrian Pine at Oranmore, Co. Galway. A few of these caterpillars pupated, and male flies have emerged during the present month (May, 1908).

A new Larch Sawfly.*Nematus maculiger*, Cameron.

(Plate LIII., H.)

In December, 1906, Mr. W. B. Bruce handed me some sawflies of the genus *Nematus*, which had been identified for him by the English Board of Agriculture as *N. maculiger*, Cameron. He had taken caterpillars off the top shoots of young Japanese larches (*Larix leptolepis*) in Lord Ardilaun's grounds, St. Anne's, Clontarf, on July 5th, 1905. The caterpillars spun cocoons a few days later, and the flies emerged on April 29th, 1906. As Cameron, in his description of *N. maculiger* (5, pp. 118-119), states that the larva feeds on willow, I delayed publishing any record of the species until I had sent one of the specimens to Mr. F. V. Theobald, who, after kindly comparing it with Cameron's type in the British Museum, informs me that he considers it referable to *N. maculiger*. We must conclude, therefore, that the species is not confined to one type of food-plant. The specimen (Plate LIII., H) which I have before me, presented by Mr. Bruce to the National Museum, is a male, almost entirely black above, with the legs clear yellow and no black on the hind shins and feet. In Cameron's description, it is stated that there is variation in this character in different specimens. The occurrence of the species in Ireland is of interest, as Cameron states that it is a rare and local insect, recorded from the Clyde district, Worcester, and Sweden.

The Spruce Aphid.*Chermes abietis*, Kalt.

The characteristic galls of this aphid were sent in February, from Ballyhaise, Co. Cavan, by Mr. G. O. Sherrard. These galls are modified buds of the Common Spruce (*Picea excelsa*), and resemble small fir-cones in appearance. They contain numerous small chambers in which the insects live. The life-cycles of the European species of *Chermes* have been closely studied in recent

years by Cholodkovsky (8), whose results are summarized for English readers in a clear and useful article by Burdon (4); the latter author adds some valuable original observations on the forms found by him in the neighbourhood of Cambridge.

Chermes forms a somewhat aberrant genus of the Aphidæ, allied to the notorious *Phylloxera* of the vine. The cornicles, so conspicuous on the abdomen in most aphids, are absent. The head is depressed and sometimes fused with the prothorax; the piercing jaws are very elongate in the wingless, shorter in the winged races; the feelers and legs are comparatively short. The gall received in February was dry and its chambers open, the young *Chermes* reared in it having left in the preceding summer. None of the insects themselves were observed, so that it is not possible yet to be sure which species of the genus may inhabit Ireland.



FIG. 10.—Spruce Aphid, *Chermes abietis*. Winged and wingless females with eggs, magnified; feeler, highly magnified; galls, natural size.

According to Cholodkovsky, some species or races of *Chermes* are entirely confined to the spruce and have no sexual generation, reproducing always parthenogenetically. Others migrate periodically between the spruce and the larch and have a sexual generation on the spruce whose members are the offspring of migrants from the larch. The species which Cholodkovsky identifies as *Chermes abietis*, Kalt., is stated by him to be non-

migratory. From eggs laid in August are hatched young, which hibernate on the buds of the spruce attached by their long beaks. In spring they begin to suck, and become in three or four weeks mature, wingless, parthenogenetic females, which lay their eggs and die. The attacked bud swells and forms a chambered gall within which the young of the next generation live and feed. Before their last moult they come out of their chambers, and develop on the needles into winged adults. These lay eggs whence develop the wintering young, so that there are two alternating parthenogenetic races—one wingless and the other winged.

A closely allied species, *C. viridis* Ratz., formerly confounded with *C. abietis*, has migratory habits and a sexual generation. Here the winged females migrate to larch to lay their eggs; and on that tree the young pass the winter in crevices of the bark. They become adult in spring, and though they form no galls, their presence on the tree and the perforations that they make allow entrance to the spores of the canker fungus. From their eggs are hatched a summer brood of winged parthenogenetic females, which migrate back to the spruce in early summer and lay eggs thereon. From these eggs are developed the small sexual insects—wingless males and females—from whose fertilized eggs arise the wingless parthenogenetic race destined to produce galls in the ensuing spring.

The winged virgin females are, in both species, the largest race, measuring 2–2.5 mm. in length, the wingless gall-makers being about .7 mm., and the sexual forms of *C. viridis* only .5 mm. According to Cholodkovsky the virgin wingless females and their eggs are yellow in *C. abietis*, and green in *C. viridis*, and there are minute structural differences between the two forms corresponding with the differences in life-cycle noted above. Burdon found, however, that the specimens of *Chermes* examined by him at Cambridge did not conform strictly to these distinctions, so that he felt doubtful as to which species they should be referred to. The question presents, therefore, much opportunity for further research.

The Tasmanian Storehouse Beetle.

Ptinus tectus, Boield.

(Plate LIV.)

In November our Registrar, Mr. R. J. Moss, handed me a tin of almonds from his house at Killiney, in which were feeding a number of small rotund beetles covered with a fine golden pubescence. The species being unknown to me, I consulted my friend, Mr. J. N. Halbert, of the National Museum, who kindly identified the beetle as *Ptinus tectus*, Boieldieu. It was first recorded from the British Islands three years ago by Hudson Beare (2), having been found several years before that in a granary at Stroud, Kent, and in a London shop. Later in 1905 it was noticed at Liverpool and elsewhere in the north of England; and in 1906 Hudson Beare (3) announced two Scottish localities—a flour-mill at Dunfermline and a bake-house at Stromness in the Orkneys. All the localities so far noticed are seaports or places near ports, and the beetle must doubtless be regarded as a recent importation from abroad, though it may possibly become well established in our islands in course of time. According to Mr. C. O. Waterhouse, its probable home is Tasmania.

The genus (*Ptinus*), to which it belongs, is world-wide in distribution, and we have several species that feed in timber, of which the well-known *Ptinus fur* is the most common. Probably a large proportion of the household store-house insects, which are now regarded as regular members of our fauna, were introduced by commerce into this country before the species of small insects had been carefully studied and distinguished.

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EXPLANATION OF PLATE XLIX.

PLATE XLIX.

A—Common Rustic Moth (*Apamea didyma*). Two varieties of the moth with caterpillar on grass. Photograph by T. Price.



A

EXPLANATION OF PLATE L.

PLATE L.

B—"Turnip-flies." 1. *Phyllotreta nemorum*. 2. *P. consobrina*.
Magnified. Photograph by T. Price.

C—Mangold-eating Ground-beetles. 1. *Pterostichus cupreus*.
2. *Taphria nivalis*. Magnified. Photograph by T. Price.



1

2

B



1

2

C

EXPLANATION OF PLATE LI.

PLATE LI.

D—Brocade-Moth (*Mamestra oleracea*) and its caterpillar.

Photograph by T. Price.

E—Cabbage-Moth (*Mamestra brassicæ*) and its caterpillar.

Photograph by T. Price.



D



E

EXPLANATION OF PLATE LII.

PLATE LII.

F—Tobacco Seedlings eaten by Wireworms. Photograph by T. Price.



EXPLANATION OF PLATE LIII.

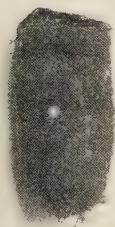
PLATE LIII.

G—Vapourer Moth (*Orgyia antiqua*). Male, Female, Cocoon, Eggs, and Caterpillars. Photograph by I. Swain.

H—Sawfly (*Nematus maculiger*) and its cocoon. Magnified. Photograph by T. Price.



G



H

PLATE LIV.

J—Beetles (*Ptinus tectus*) with larvæ on Almonds. Magnified.
Photograph by T. Price.





